

Medical Problem Solving, Expertise and Artificial Neural Networks

Ron Stevens, Ph.D., Alina Lopo, Ph.D., Tung V. Huynh and Edward Livingston, M.D.
UCLA School of Medicine, Los Angeles, California

Problem solving situations/simulations can play an important role in defining and evaluating medical students' problem solving processes. One set of experimental situations consists of research studies that explore cognitive processes of a limited number of students. These studies are not designed to analyze the protocol of a patient workup but rather are important for defining the theoretical basis for novice and expert knowledge structures and behaviors in medicine.

Other simulations, i.e., the CBX program of the National Board of Medical Examiners, encompass broad areas of medicine and are designed for medical evaluation/licensing purposes. These simulations evaluate large populations of students in diverse disciplines with performance being judged relative to the consensus opinion of experts. The specific details of the examinees' reasoning in these simulations are approachable but time intensive.

Many medical educational activities however reside between these two situations often involving limited content domains (i.e., the individual basic sciences) and restricted clinical complexity.

This suggests a need for simulations and interpretive/evaluation tools which could be applied to multiple disciplines where expertise is beginning to be developed, and which could begin to model how a student acquires, stores and processes knowledge. The IMMEX Problem Solving Software system is designed to satisfy these needs.

IMMEX is a Windows-based development and implementation software environment which simplifies the construction of problem solving modules in multiple disciplines. This software is unusual in that it subsequently allows the evaluation of individual student's or groups of students' performances on these problems [1-3]. This enables faculty to determine not only if students solved a problem but also how information was gathered and interpreted during

the process. The software consists of three modules: IMMEX::AUTHOR and DELIVERY simplifies the generation and delivery of problem solving modules, IMMEX::ANALYSIS is a graphical interface into the database of student performances which diagnostically maps students problem solutions, and IMMEX::NEURAL which is trainable neural network software which 'learns' from successful student problem approaches and can enhance the evaluation of subsequent students performances by functioning as an electronic critic [4].

In the session, problem solving modules in Immunology, Infectious Disease and Surgery will be presented and the process to modify/extend these problems will be demonstrated.

The demonstration will next include a graphical analysis of student performance of the modules and the linkage this information to software for performing neural network analysis.

References

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